REMARKS

Reconsideration and allowance of the present patent application based on the following remarks are respectfully requested.

By this Amendment, claims 1 and 23-25 are amended and claims 2-5 and 21-22 are cancelled without prejudice or disclaimer therein. Support for the amendments to the claims can be found throughout the original disclosure. No new matter has been added. Accordingly, after entry of this Amendment, claims 1, 6-20 and 23-26 will remain pending in the application.

Claims 1-2, 6-13, 18-19, 21 and 26 were rejected under 35 U.S.C. §102(b) based on U.S. Pat. No. 6,333,016 to Resasco *et al.* (hereinafter "Resasco I"). The rejection is respectfully traversed.

Claims 2 and 21 are cancelled without prejudice or disclaimer, thus rendering moot the rejection of these claims.

Claim 1 is amended to positively recite the features of claims 3 and 22, which have been deemed novel over Resasco I. *See* Office Action at paragraphs 4 and 8. Therefore, Applicant respectfully submits that claim 1, as amended, is patentable over Resasco I. Specifically, claim 1 is patentable over Resasco I at least because this claim recites a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "continuously providing substrate particles; providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

Claims 6-13, 18-19 and 26 are patentable over the cited portions of Resasco I at least by virtue of their dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 1-2, 6-13, 18-19, 21 and 26 under 35 U.S.C. §102(b) based on Resasco I are respectfully requested.

Claims 3, 15-17 and 24 were rejected under 35 U.S.C. §103(a) based on Resasco I in view of U.S. Pat. No. 5,165,909 to Tennent *et al.* (hereinafter "Tennent I"). The rejection is respectfully traversed.

Claim 3 is cancelled without prejudice or disclaimer, thus rendering moot the rejection of this claim.

As noted previously, claim 1 is amended to positively recite the features of claim 22, which has not been rejected over the combination of Resasco I and Tennent I. Therefore, for at least this reason, Applicant respectfully submits that claim 1 is patentable over Resasco I, Tennent I and any proper combination thereof. Specifically, claim 1 is patentable over Resasco I, Tennent I and any proper combination thereof at least because this claim recites a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

By way of review, Resasco I discloses a method of producing carbon nanotubes involving the step of forming a bimetallic catalyst in *situ* through decomposition of a precursor compound such as bis (cyclopentadienyl) cobalt or bis(cyclopentadienyl) molybdenum chloride. *See* Resasco I at col. 5, lines 26 to 29. The catalyst can be deposited on a support and carbon nanotubes are produced by contacting a carbon containing gas with metallic catalytic particles. The process used in Resasco I may be continuous or a batch process.

With this said, there is nothing in Resasco I that relates to transition metal oxalates or formates. The only decomposable catalyst precursor compounds suggested by Resasco I are bis(cyclopentadienyl) cobalt or bis(cyclopentadienyl) molybdenum chloride. Furthermore, the method disclosed in Resasco I involves the step of reducing the catalyst precursors in the presence of hydrogen gas before reacting the catalyst with a carbon source. *See* Resasco I at Examples 1 to 6. There is no suggestion in Resasco I that the catalyst particles, whether deposited on a support or not, are fluidized with a flow of gaseous carbon source. It is therefore submitted that there is nothing in Resasco I that would result in a skilled person arriving at the method of claim 1.

Tennent I fails to remedy the deficiencies of Resasco I. Tennent I discloses a method of forming a carbon fibril with a diameter of between about 3.5 and 70 nanometers. The catalyst used can be a metal containing particles derived from metal salts that thermally decompose to metallic particles or metallic oxide particles. Suitable metal salts disclosed by Tennent I include carbonates, bicarbonates, nitrates, citrates and oxalates. *See* Tennent I at col. 8, lines 5 to 10. While Tennent I reveals that various metal salts, including oxalates, can be thermally decomposed to metallic particles or metallic oxides, the examples of Tennent I

demonstrate that carbon fibrils were only generated under conditions where the catalyst was treated with hydrogen prior to contact with the carbon-containing gas. *See* Tennent I at col. 13, lines 39 to 42 and Table I. Tennent I therefore does not disclose a method of producing carbon nanotubes involving decomposing the transition metal compound to the transition metal in a non-reducing atmosphere. Nor does Tennent I disclose, teach or suggest fluidizing the substrate particles with a flow of a gaseous carbon source. Therefore, any proper combination of Resasco I and Tennent I cannot result, in any way, in the invention of claim 1.

Claims 15-17 and 24 are patentable over Resasco I, Tennent I and any proper combination thereof at least by virtue of their dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 3, 15-17 and 24 under 35 U.S.C. §103(a) based on Resasco I in view of Tennent I are respectfully requested.

Claims 4-5 and 24 were rejected under 35 U.S.C. §103(a) based on Resasco I in view of DE 10043891 to Unger. The rejection is respectfully traversed.

Claims 4 and 5 are cancelled without prejudice or disclaimer, thus rendering moot the rejection of these claims.

Claim 1 is amended to positively recite the features of claim 22, which has not been rejected over the combination of Resasco I and Unger. Therefore, for at least this reason, Applicant respectfully submits that claim 1 is patentable over Resasco I, Unger and any proper combination thereof.

As noted previously, Resasco I does not disclose, teach or suggest a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

Unger fails to remedy the deficiencies of Resasco I. Unger was cited by the Office for the purpose of teaching that the metal salt can contain (alkyl)cyclopentadienyl or carbonyl groups. With this said, Unger is silent as to the above features of claim 1. Accordingly, any proper combination of Resasco I and Unger cannot result, in any way, in the invention of claim 1.

Claim 24 is patentable over Resasco I, Unger and any proper combination thereof at least by virtue of its dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 4-5 and 24 under 35 U.S.C. §103(a) based on Resasco I in view of Unger are respectfully requested.

Claim 14 was rejected under 35 U.S.C. §103(a) based on Resasco I in view of U.S. Pat. No. 5,997,832 to Lieber *et al.* (hereinafter "Lieber"). The rejection is respectfully traversed.

Claim 1 is amended to positively recite the features of claim 22, which has not been rejected over the combination of Resasco I and Lieber. Therefore, for at least this reason, Applicant respectfully submits that claim 1 is patentable over Resasco I, Lieber and any proper combination thereof.

As noted previously, Resasco I does not disclose, teach or suggest a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

Lieber fails to remedy the deficiencies of Resasco I. With this said, Lieber is silent as to the above features of claim 1. Accordingly, any proper combination of Resasco I and Lieber cannot result, in any way, in the invention of claim 1.

Furthermore, Lieber discloses methods of making carbide nanorods. According to Lieber, "carbide" means a compound of carbon and one or more elements more electropositive than carbon, excluding hydrogen. *See* Lieber at col. 3, lines 50 to 52. A carbide is chemically different from a carbon nanotube and a person skilled in the art would realize that different synthetic methods are required. Accordingly, a skilled person would not consider Lieber when intending to make carbon nanotubes and would not combine Lieber with Resasco I. Thus, for this additional reason, claim 1 is patentable over the combination of Resasco I and Lieber.

Claim 14 is patentable over Resasco I, Lieber and any proper combination thereof at least by virtue of its dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claim 14 under 35 U.S.C. §103(a) based on Resasco I in view of Lieber are respectfully requested.

Claim 20 was rejected under 35 U.S.C. §103(a) based on Resasco I in view of U.S. Pat. No. 6,955,800 to Resasco *et al.* (hereinafter "Resasco II). The rejection is respectfully traversed.

Claim 1 is amended to positively recite the features of claim 22, which has not been rejected over the combination of Resasco I and Resasco II. Therefore, for at least this reason, Applicant respectfully submits that claim 1 is patentable over Resasco I, Resasco II and any proper combination thereof.

As noted previously, Resasco I does not disclose, teach or suggest a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

Resasco II fails to remedy the deficiencies of Resasco I. Resasco II teaches a method for catalytic production of carbon nanotubes. Catalytic particles may be prepared by impregnating a support with solutions containing transition metal precursors. Disclosed precursor compounds by Resasco II include bis(cyclopentadienyl) cobalt or bis(cyclopentadienyl) molybdenum chloride. *See* Resasco II at col. 7, lines 32 to 35. Importantly, catalytic particles are exposed to a reducing gas such as hydrogen to prepare the catalytic particles for catalysis prior to exposure to a carbon-containing gas. *See* Resasco II at col. 3, line 65 to column 4, line 12. Resasco II therefore does not disclose a method of producing carbon nanotubes involving the step of decomposing the transition metal compound to the transition metal in a non-reducing atmosphere. Therefore, any proper combination of Resasco I and Resasco II cannot result, in any way, in the invention of claim 1.

Claim 20 is patentable over Resasco I, Resasco II and any proper combination thereof at least by virtue of its dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claim 20 under 35 U.S.C. §103(a) based on Resasco I in view of Resasco II are respectfully requested.

Claim 22 was rejected under 35 U.S.C. §103(a) based on Resasco I in view of U.S. Pat. No. 5,578,543 to Tennent *et al.* (hereinafter "Tennent II") and further in view of U.S. Pub. No. 2003/0086859 to Kawakami *et al.* (hereinafter "Kawakami"). The rejection is respectfully traversed.

Claim 1 is amended to positively recite the features of claim 22. Claim 22 is cancelled without prejudice or disclaimer to the subject matter therein.

As noted previously, Resasco I does not disclose, teach or suggest a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

Tennent II and Kawakami fail to remedy the deficiencies of claim 1.

By way of review, Tennent II discloses a continuous method for producing carbon fibrils by contacting at a suitable pressure metal containing particles with a suitable gaseous carbon-containing compound. *See* Tennent II at col. 3, lines 47 to 50. Tennent II teaches that a variety of transition metal containing particles are suitable as catalysts. These metal containing particles do not need to be in an active form before entering the reactor where the carbon fibrils are made as long as they can be readily activated through a suitable pre-treatment or under reaction conditions. Examples 11 to 33 of Tennent II reveal various fibril synthesis runs with different catalysts and in all of the experiments where fibrils resulted, the pre-treatment conditions included pre-treatment with the reducing gas hydrogen. See Tennent II at Table 1. Tennent II therefore does not disclose a method of producing carbon nanotubes involving the aspect of decomposing the transition metal compound to the transition metal in a non-reducing atmosphere.

Kawakami discloses a method for producing carbon nanotubes. However, Kawakami is silent as to decomposing a transition metal compound to the transition metal in a non-reducing atmosphere. Further, the method of Kawakami involves contacting an aromatic compound containing starting material with a transition metal element-containing catalyst in a supercritical or subcritical fluid. The temperature is in a range of from 350 to 800°C and the pressure is in a range from 3 to 50 MPa. *See* Kawakami at [0023]. The skilled person would understand that reaction processes are often very different when performed under supercritical and subcritical fluid conditions when compared to reactions occurring at much closer to ambient conditions, for instance at the pressures of the reaction of the presently claimed invention. A skilled person would accordingly not consider Kawakami for any teaching relating to production of carbon nanoparticles under conditions of ambient pressure.

Therefore, any proper combination of Resasco I and Tennent II cannot result, in any way, in the invention of claim 1.

Accordingly, reconsideration and withdrawal of the rejection of claim 22 based on Resasco I in view of Tennent II and further in view of Kawakami are respectfully requested.

Claim 23 was rejected under 35 U.S.C. §103(a) based on Resasco I and Tennent II in view of U.S. Pat. No. 6,290,775 to Kohlen *et al.* (hereinafter "Kohlen").

Claim 1 is patentable over Resasco I, Tennent II and any proper combination thereof at least because this claim recites a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...."

Kohlen fails to remedy the deficiencies of Resasco I and Tennent II. Kohlen discloses a fluidized bed reactor with a granule discharge device for the continuous production of granules. A skilled person looking to make carbon nanoparticles, which are not granules, would accordingly not look to Kohlen. Further, Kohlen is silent as to a method of producing carbon nanotubes involving the aspect of decomposing the transition metal compound to the transition metal in a non-reducing atmosphere.

Therefore, any proper combination of Resasco I, Tennent II, Kohlen and any proper combination thereof cannot result, in any way, in the invention of claim 1.

Claim 23 is patentable over Resasco I, Tennent II, Kohlen and any proper combination thereof at least by virtue of its dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claim 23 under 35 U.S.C. §103(a) based on Resasco I and Tennent II in view of Kohlen are respectfully requested.

Claim 25 was rejected under 35 U.S.C. §103(a) based on Resasco I and Unger in view of Kawakami. The rejection is respectfully traversed.

Claim 1 is amended to positively recite the features of claim 22, which has not been rejected over the combination of Resasco I, Unger and Kawakami. Therefore, for at least this reason, Applicant respectfully submits that claim 1 is patentable over Resasco I, Unger, Kawakami and any proper combination thereof.

As noted previously, Resasco I, Unger and Kawakami do not disclose, teach or suggest a continuous method of production of carbon nanoparticles, comprising, *inter alia*, "providing on the substrate particles a transition metal formate or oxalate which is decomposable to yield the transition metal under a non-reducing atmosphere permitting carbon nanoparticle formation; fluidizing the substrate particles with a flow of gaseous carbon source; [and] heating the transition metal formate or oxalate on the substrate particles...." Therefore, any proper combination of Resasco I, Unger and Kawakami cannot result, in any way, in the invention of claim 1.

Claim 25 is patentable over Resasco I, Unger, Kawakami and any proper combination thereof at least by virtue of its dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claim 25 under 35 U.S.C. §103(a) based on Resasco I and Unger in view of Kawakami are respectfully requested.

Applicant has addressed the Examiner's rejections and respectfully submits that the application is in condition for allowance. A notice to that effect is earnestly solicited.

If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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